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A NEW NORTH AMERICAN BIRD-FLEA

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Dr. Phyllis T. Johnson, of the Entomology Research Division, U. S. Department of Agriculture, Washington D. C., most kindly invited me to describe a new bird-flea, material of which was found in the collections of the U. S. National Museum. The specimens of the new flea were collected from the nest of a barn swallow and are part of a series which constitutes the first record of fleas from the North American subspecies of this host. It is a subspecies of *Ceratophyllus affinis* Nordberg, 1935, and the host record is a valuable indication as regards the true host of the little-known nominate subspecies.

I am much indebted to the authorities of the U. S. National Museum for the donation of one pair of paratypes of the new flea to the British Museum collection of fleas at Tring.

***Ceratophyllus affinis neglectus*, new subspecies**

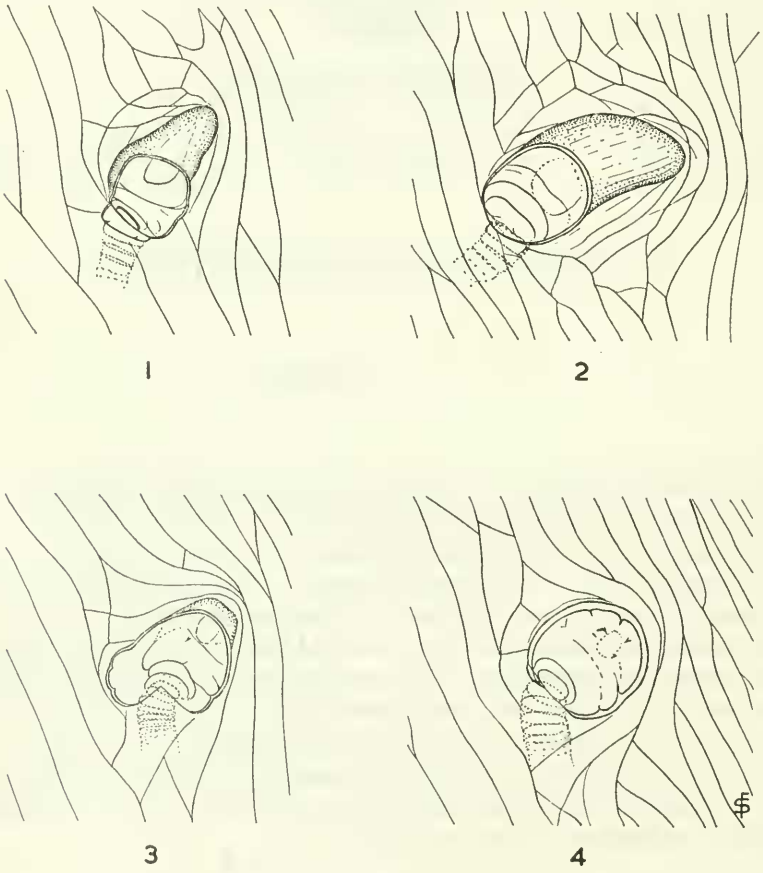
Figures 1, 2, 5–10

Type material: Male holotype, female allotype, and 2 ♂, 2 ♀ paratypes from Smithfield, northern Utah, U. S. A., from nest of barn swallow *Hirundo rustica erythrogastra*, June 6, 1951, collected by

[1] British Museum (Natural History), The Zoological Museum, Tring, Herts.

T. Tibbetts.[2] Holotype, allotype and two paratypes (1 ♂, 1♀) in the collection of the U. S. National Museum, and two paratypes (1 ♂, 1 ♀) in the British Museum collection of fleas at Tring.

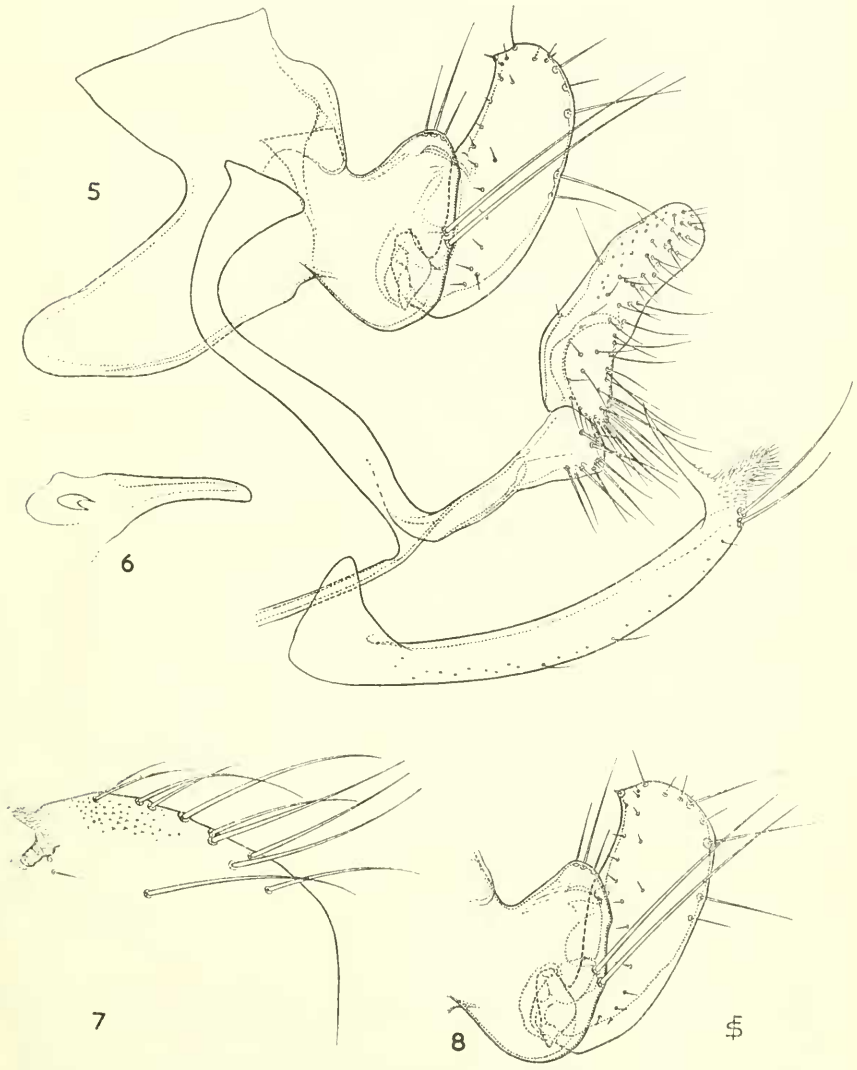
DIAGNOSIS: The new subspecies differs from all known representatives of the genus *Ceratophyllus* by the great development of the postspiracular area of the spiracular fossa on terga II–VII (figs. 1, 2); in the nominate subspecies the postspiracular areas are somewhat less



FIGURES 1–4.—Spiracular fossa of tergum VII of: 1, *Ceratophyllus affinis neglectus*, new subspecies, male, holotype; 2, *C. a. neglectus*, female allotype; 3, *Ceratophyllus niger* C. Fox, male, from Essington, British Columbia; 4, *C. niger*, female, from Essington, British Columbia.

[2] Cross and Knowlton (1953) recorded material with virtually identical data, but determined as *Ceratophyllus garei* Roths., "collected from nests of the barn swallow, *Hirundo erythrogaster*, by T. Tibbets and L. Dale Haws at Smithfield, Utah, June 7, 1951." Although *C. garei*, a flea of damp birds' nests, is known to occur in Utah, it is very likely that the specimens recorded by Cross and Knowlton will also prove to be representatives of *C. affinis neglectus*. One pair of the USNM specimens was misdetermined as *Ceratophyllus niger*, while the other two pairs had not been determined.

well developed, though still very conspicuous and larger than in any other species of the genus. The new subspecies differs from the nominate form in the male by the longer movable process of the clasper (fig. 5) and the much more weakly developed spiculose area of tergum VIII (fig. 7); in the female by the slightly less prominent lateral lobe of sternum VII (figs. 9, 10) and a somewhat zigzag-shaped sclerotized portion of the ductus obturatus (if this latter characteristic proves to be constant, which seems doubtful). For figures of pertinent struc-



FIGURES 5–8.—*Ceratophyllus affinis neglectus*, new subspecies, male: 5, clasper, sternum IX and sternum VIII, holotype; 6, aedeagal crochet, holotype; 7, dorsal part of tergum VIII, holotype; 8, processes of clasper, paratype.

tures of *C. a. affinis* see Darskaya (1950) and Smit (1956). The polytypic species *C. affinis* appears to be related to *Ceratophyllus idius* Jordan and Rothschild and, more distantly, to *C. niger* C. Fox.

DESCRIPTION: Head with a moderately developed frontal tubercle; preantennal region with a frontal row of six or seven setae in the male, in the female the frontal row is vestigial and consists of only a few minute setae; ocular row with three setae in both sexes; postantennal region of head with three or four setae above the antennal fossa and a posterior row of five or six setae each side. The long setae of the antennal pedicel reach to about the seventh segment of the club in the male, and well beyond the apex of the club in the female. Labial palp not quite reaching the apex of the fore coxa.

Pronotum with a ctenidium of 31–33 spines, the most dorsal of which are about as long as the pronotum anterior to the upper spines (as in *C. idius;* in *C. niger* the pronotum is dorsally much longer than the pronotal spines). Mesepimeron with one or two setae on the middle of the surface though fairly close to the mesopleural rod, apart from the few ventral and posterior setae (these median setae are usually also present in *C. idius,* but absent in *C. niger*). Pleural arch of metathorax well developed; squamulum of metasternum short and broad. Fifth tarsal segment of all legs with numerous minute setae scattered over the plantar surface.

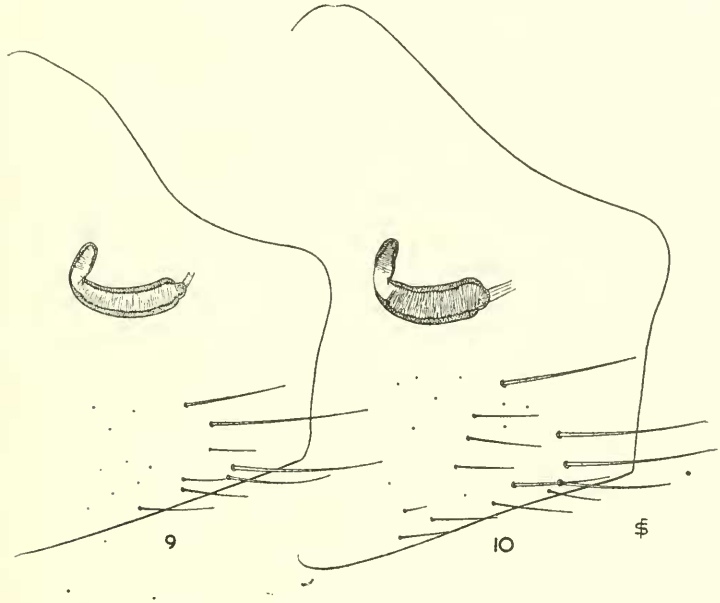
Terga I–V in the male with the following numbers of marginal spinelets per side: 2, 3 (4), 2 or 3, 2, 1 (2); in the female: 2 or 3, 3 or 4, 2 (3), 1 or 2, and 0 respectively. Spiracular fossae of terga II–VII usually with large postspiracular areas, the largest for any species in the genus (figs. 1, 2; cf. figs. 3, 4), although there is considerable variation in the size of these areas on individual segments.

In other respects the structure and chaetotaxy of the head, thorax, legs, and unmodified abdominal segments are as in related species.

Male (figs. 5–8): Tergum VIII (fig. 7) with a weakly developed and rather narrow spiculose area, a row of 9–13 strong setae along the dorsal margin and two or three setae on the lateral surface. Sternum VIII (fig. 5) long and narrow, distinctly curved upwards, with a triangular basal portion, two slender apical setae, and a long and narrow apical membranous process which bears a posteriorly directed, rather narrow, spiculose basal lobe, as in the nominate subspecies. Manubrium of clasper fairly broad basally; fixed process almost quadrangular, with a broadly rounded apex; the two acetabular setae are situated not far below the middle of the posterior margin of the clasper (fig. 5). Movable process (figs. 5, 8) elongate, its smoothly convex posterior margin bearing several slender setae along the upper half, while the anterior margin is angulate at about the middle. Apical lobe of the distal arm of sternum IX (fig. 5) narrowing very

little towards the truncate apex; chaetotaxy of this arm as shown in figure 5. Aedeagal crochet with a fairly long, narrow, and blunt tipped apical portion (fig. 6).

Female (figs. 9, 10): This sex resembles that of *C. a. affinis* very closely and the main differences, apart from the average size of the postspiracular areas, are that in the new subspecies the lateral lobe of sternum VII projects to a lesser degree and the margin below the lobe is almost straight (figs. 9, 10), not markedly concave as in *C. a.*



FIGURES 9, 10.—*Ceratophyllus affinis neglectus*, new subspecies, female: 9, sternum VII and spermatheca, allotype; 10, sternum VII and spermatheca, paratype.

affinis, and the heavily sclerotized basal part of the ductus obturatus is somewhat zigzag-shaped in the three females studied (this may be an abnormality), while this duct is smooth (as is normal) in *C. a. affinis*. The length of the cylindrical bulga of the spermatheca (figs. 9, 10) appears to be fairly variable, but the shorter of the two drawn (fig. 10) is like that of the nominate subspecies and is therefore presumably the normal type.

Length: Male, 3 mm; female, 3.5 mm.

REMARKS: We know as yet extremely little about the range of distribution or true host of *C. a. affinis;* the specimens (2♂, 4♀) from southwest Finland are from an unknown host (Smit, 1956), but it is most significant that the specimens (11♂, 20♀) recorded by Darskaya (1950) from the Vologda oblast (roughly 450 km. north of Moscow) came from the nest of *Hirundo rustica* [*rustica*], for *C. a.*

neglectus was collected from the nest of another subspecies of the Holarctic *H. rustica*, namely *H. r. erythrogastra*. Both subspecies of barn swallow build similar nests in similar places, and it may well be assumed now that *H. rustica* is the true host of *C. a. affinis*.

The differences in structure between these two forms of barn swallow fleas are fairly pronounced, and some workers would perhaps consider them to be full species. However, the differences between, e. g., *Ceratophyllus styx styx* Rothschild and *C. s. jordani* Smit, which are certainly subspecies and are parasites of the sand martin *Riparia riparia* in Europe, are even more pronounced than those between the two subspecies of *C. affinis*. Both barn swallow and sand martin build very isolated nests and they live in a considerable degree of isolation from other hosts. It is an acknowledged fact that isolation favors evolution and this may explain why the differences between subspecies of fleas which live in identical isolated ecological habitats (e. g., the fleas of the swallow and the sand martin) are greater than those between subspecies of fleas infesting hosts which occupy less isolated ecological habitats (e. g., the two subspecies of the tree-squirrel flea *Tarsopsylla octodecimdentata*, *T. o. octodecimdentata* (Kolenati) in the Palaearctic region, and *T. o. coloradensis* (Baker) in the Nearctic region). Thus the degree of differences between *C. a. affinis* and *C. a. neglectus* might be interpreted as being the result of the occurrence of these fleas in isolated habitats and therefore strengthens the assumption that *C. a. affinis*, as well as *C. a. neglectus*, is a parasite of *Hirundo rustica*. If the true host (and the ecological factors concerning its nest) of one of the subspecies should prove to be different, it would be necessary to regard *affinis* and *neglectus* as full species, for, apart from considerations of geographical, morphological, and reproductive isolation, it seems that in fleas we must usually also stipulate that subspecies of a certain species must occupy almost identical ecological niches, since it seems extremely probable that if two fleas have diverged so much as to be able to occupy substantially different niches they will also have become too distant to have retained the capacity to interbreed without impairment of fertility. Thus, though the structural differences between *Xenopsylla ramesis* (Rothschild) (a parasite of gerbils) and *X. cunicularis* Smit (infesting the rabbit in Morocco) are very small, and the two forms appear not to be sympatric, I regard them as full species because of the very different nesting habits of their hosts.

It may be that another form, more or less intermediate between *C. a. affinis* and *C. a. neglectus*, occurs in eastern Siberia. Since barn swallows are widely distributed and travel over great distances, it seems likely that the distribution of the subspecies of *C. affinis* will

also be found to cover a large area, and it is to be hoped that collectors will turn their attention to the usually easily collected nests of barn swallows. In Europe the nests of *H. rustica*, which are now usually built inside barns and other outbuildings, are obviously too dry to form a suitable environment for the development of flea larvae; the same may apply to the nests of the North American subspecies. *Ceratophyllus affinis* must have become associated with the barn swallow long before this bird adopted man-erected shelters for nesting sites, and it seems possible that it has not been able to adapt itself to this relatively new macro-habitat, that it survives mainly in the relatively few nests which are still built in natural sites (e. g., in roofs of caves, in little rock-pockets in wild ravines, in sea-washed caverns) and that from these natural sites occasional specimens are introduced to nests in barns. This is a rather speculative suggestion and it is only by collecting fleas from large numbers of barn swallow nests from natural and man-made sites, both in the Nearctic and Palaearctic regions, that we shall learn something about this intriguing question.

After the above was written I looked through those tubes in the alcoholic portion of the Tring collection which were labeled as having been collected from *Hirundo rustica*, and to my delight found in a tube containing four males and ten females of *Ceratophyllus gallinae* (Schrank) and one male of *C. garei* Rothschild (the occurrence of all of which must be regarded as casual) a single female of *C. a. affinis* Nordberg. The fleas in the tube in question were collected from *Hirundo rustica* (presumably from a nest) at Wulfsdorf, 7 km. south of Lübeck, Germany, in 1923 by W. Blohm, and the record gives some support to my assumptions about the host and distribution of the flea. Unfortunately the Wulfsdorf specimen is somewhat abnormal (e. g., it has only two antesensilial setae each side instead of three, several setae of one midtibia are malformed, and the anal tergum seems to be shortened), so I do not feel justified in figuring any part of it, but its sternum VII and spermatheca agree perfectly with those of Finnish specimens and with the figure published by Darskaya.

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